

Improving Promotion Lift with Artificial Intelligence

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velocity
CONNECT + ACCELERATE + INNOVATE

Agenda

- ▶ AI Primer and common use cases
- ▶ Promotional Lift
- ▶ Price and Promotions Analytics
- ▶ Promotional Lift AI Demonstration
- ▶ Discussion – Growing an AI Agenda



Artificial Intelligence (AI)

- ▶ Data + Code makes **Decisions**
- ▶ **Humans Interact** with and monitor decisions
- ▶ **Humans Derive Insights**, organize new data, code new decisions
- ▶ Insights + Automation → organize new data, code new decisions, **Learn Faster**
- ▶ End state is optimal **Human-Computer Interaction**, high automation, fewer errors

10X Faster Business Decisions

Master Data Management

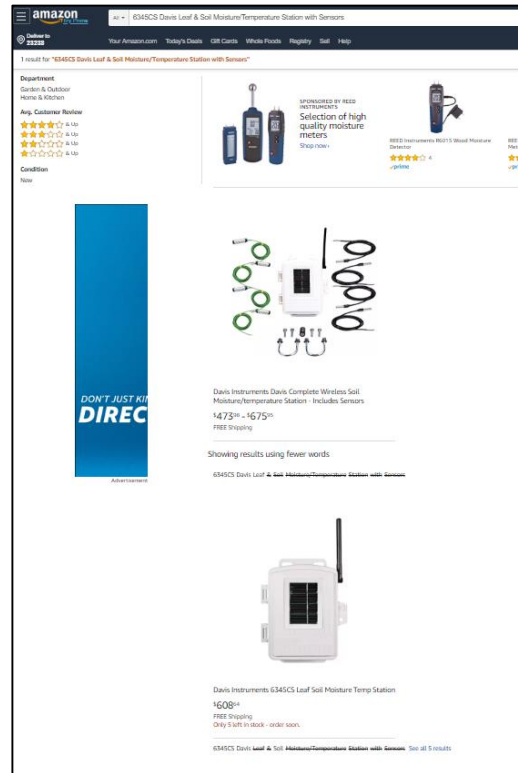
AI is Here, and a Journey

Common AI use cases

Sensors



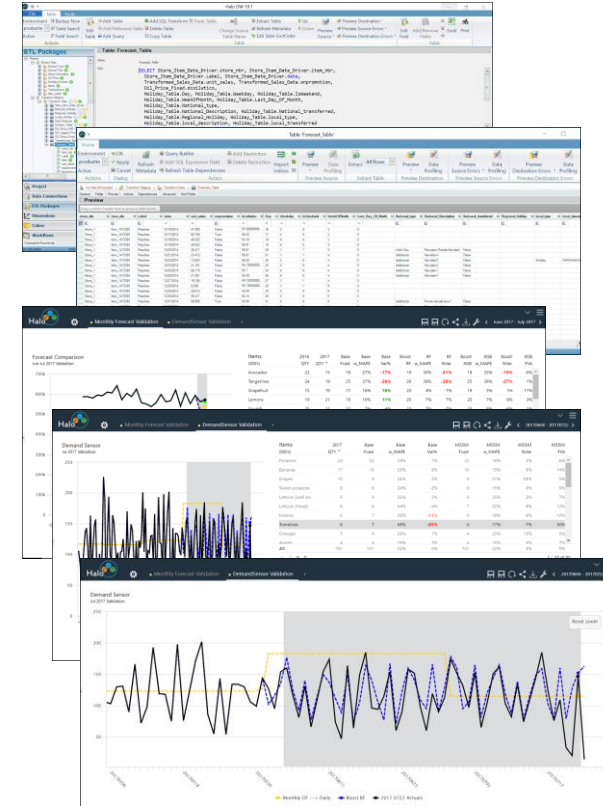
Recommender Systems



VRU



Data Science Workbench



Expert Judgment Models

**Part time jobs
Earn money from
Amazon Mechanical Turk (MTurk)**

- ✓ As a worker you can,
 - ★ Earn money online
 - ★ work from home
 - ★ Set own hours
- ✓ As a requester you can,
 - ★ Can recruit Global workers
 - ★ Get your work completed in minutes
 - ★ Pay only you are satisfied

35% of consumer believe they have interacted with AI
85% of consumer have interacted with AI
100% of Amazon users interact with AI

Promotional Lift AI – Where to Start, and End State Goal

- ▶ Price, placement, advertisement, bundling, loyalty programs, rebates → **Sales Lift**
- ▶ Factors that drive orders and fulfillment, and that are under **Management Control**
- ▶ **Causal Modeling** that requires simple elegant equations and expert review
- ▶ High data quality + test-and-learn strategy → **Fastest. Possible. Learning.**
- ▶ **Differential Treatment** of high value and high potential supplier/buyer relations

Price and Promotions Analytics starts with Price Elasticity

Analytics for an Online Retailer: Demand Forecasting and Price Optimization

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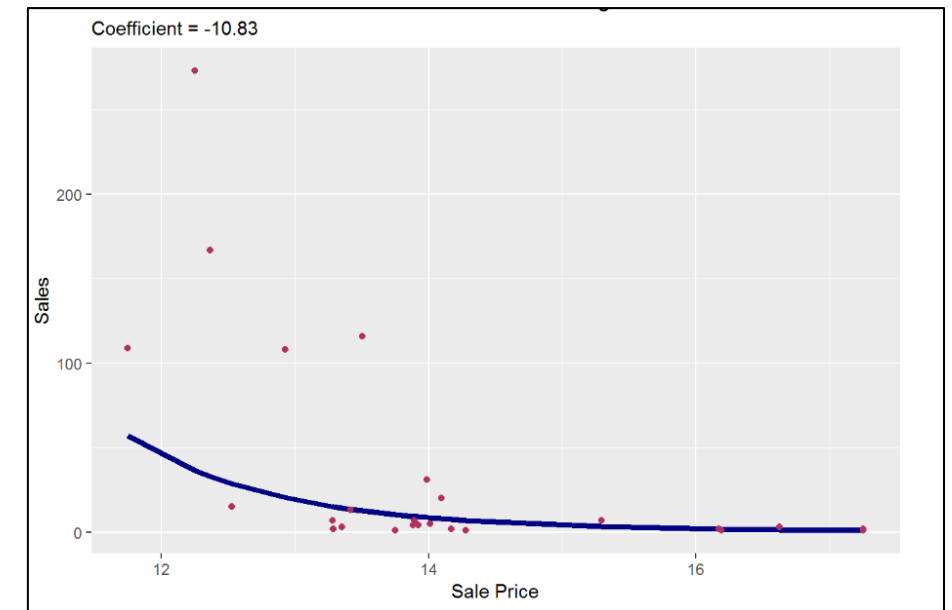
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We present our work with an online retailer, Rue La La, as an example of how a retailer can use its wealth of data to optimize pricing decisions on a daily basis. Rue La La is in the online fashion sample sales industry, where they offer extremely limited-time discounts on designer apparel and accessories. One of the retailer's main challenges is pricing and predicting demand for products that it has never sold before, which account for the majority of sales and revenue. To tackle this challenge, we use machine learning techniques to estimate historical lost sales and predict future demand of new products. The nonparametric structure of our demand prediction model, along with the dependence of a product's demand on the price of competing products, pose new challenges on translating the demand forecasts into a pricing policy. We develop an algorithm to efficiently solve the subsequent multi-product price optimization that incorporates reference price effects, and we create and implement this algorithm into a pricing decision support tool for Rue La La's daily use. We conduct a field experiment and find that sales does not decrease due to implementing tool recommended price increases for medium and high price point products. Finally, we estimate an increase in revenue of the test group by approximately 9.7% with an associated 90% confidence interval of [2.3%, 17.8%].

Log-Log Regression

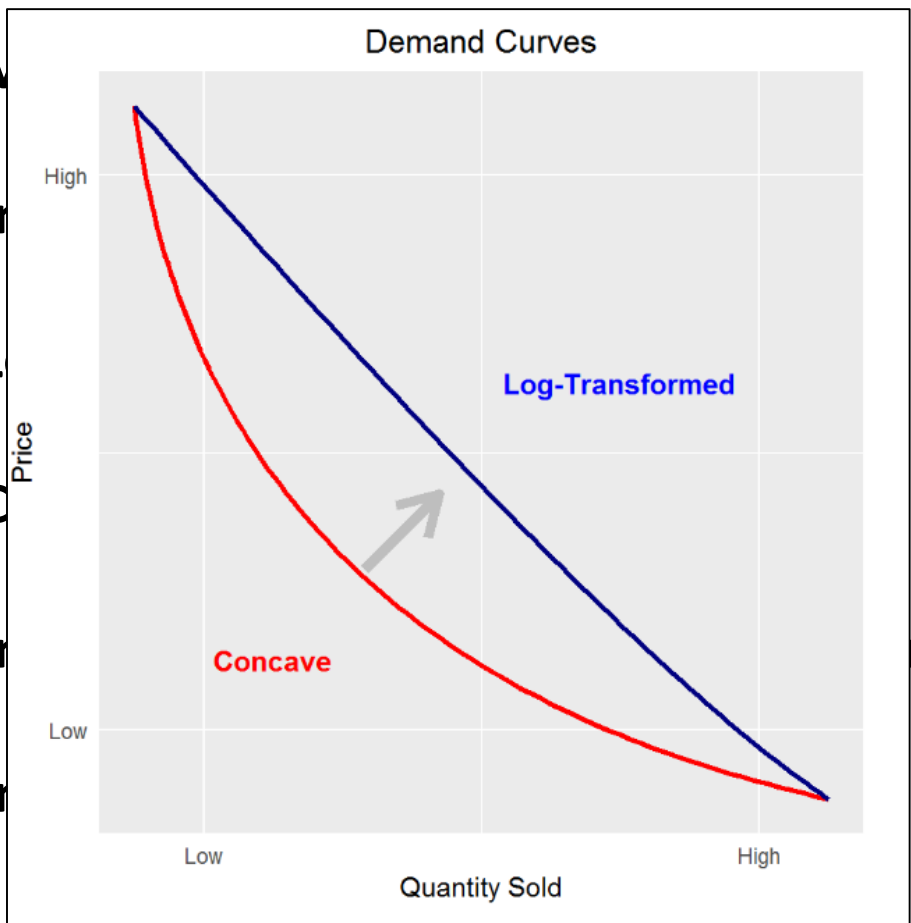


% Change in Price → % Change in Sales

A unique curve for every product and buyer

ML Analytics in an Ever Changing World

Halo Price Analytics



Reality



- ▶ N
- ▶ In
- ▶ L
- ▶ C
- ▶ In
- ▶ In
- ▶ In

ange

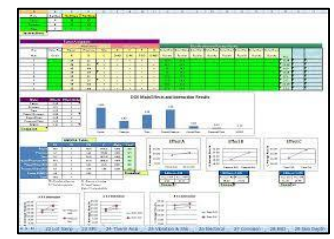
Learn where granularity adds value

Pricing and Promotions Policy

- ▶ Price is the most valuable lever that is under **Management Control**
- ▶ Allocate a small percentage of business to **Price Testing** and expect that impacts revenue by a small percentage
- ▶ Ensure that Price and Promotions are **“Counterbalanced”**
- ▶ Ensure that Price and Promotions are not wholly confounded with **Date**
- ▶ Focus on getting the **Economic “Break-Even” Calculation** correct
- ▶ Run the test, analyze results, learn → **Knowledge is Proprietary and a Competitive Advantage** for growing future profits



Test



**Knowledge
Strategy
Competitive Edge**

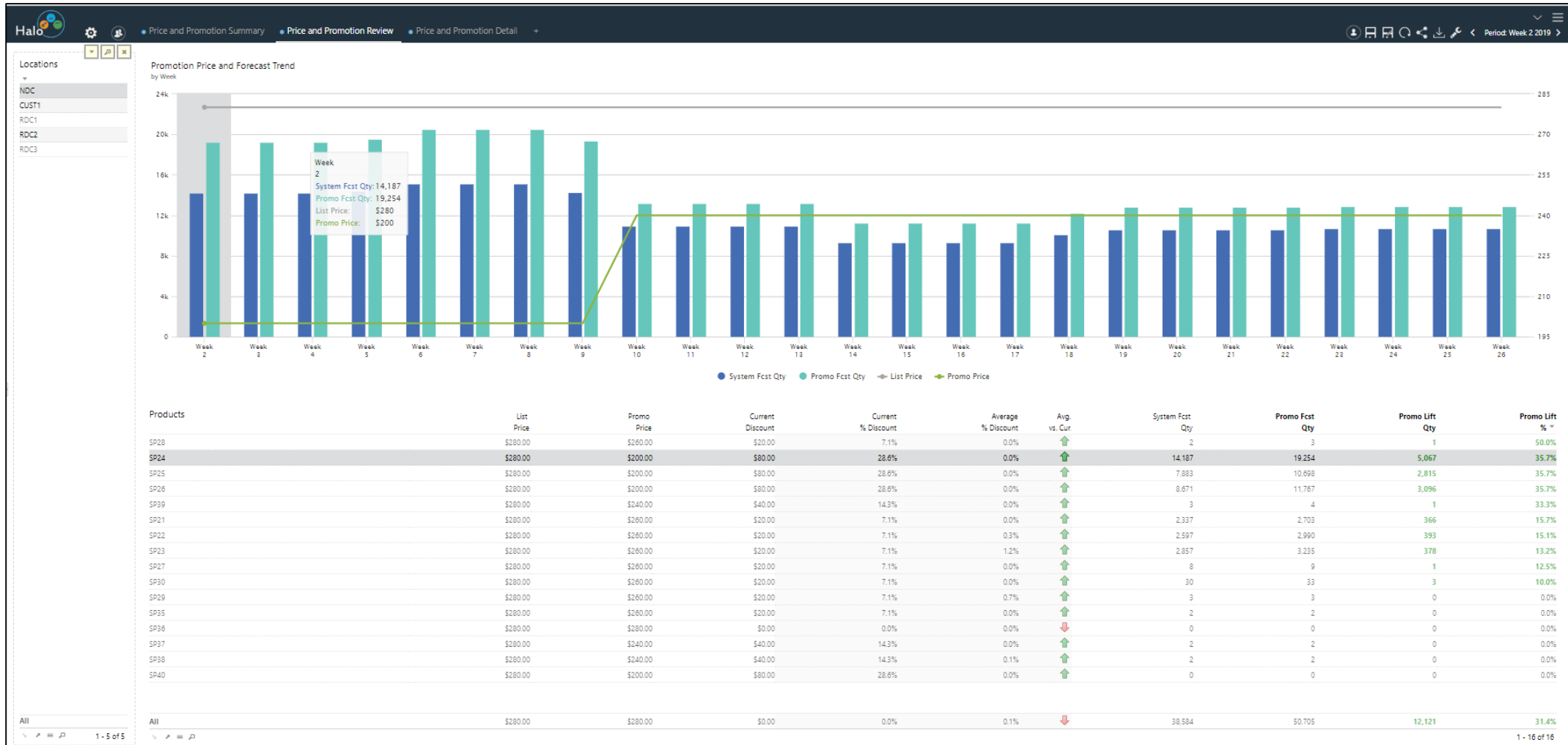
➔ **Rollout**



Putting Price and Promotions together with AI

- ▶ Test-and-Learn should be systematic – focus on creating a **High Value Data Asset**
- ▶ Price and Promotions **Policy** should include **Design of Experiments (DOE)**
- ▶ Through **DOE**, the **Unique Effects** of Price and Promotions are disentangled
- ▶ Management can then **Optimize the Investment** in discounts and promotions
- ▶ The AI can re-estimates promotional lift based on the most recent **Learning**

Live Demonstration – Price Elasticity and Forecast Adjustment



Insights from 4 price and promotions projects

- ▶ Keep the initial forecast hierarchy simple, focus on **Feature Engineering**
- ▶ Agree that the **Base Forecast** is reasonable before estimating promotional lift
- ▶ Understand the **Correlation of Promotions with Calendar Date** and buyer behavior
- ▶ Keep the initial **Causal Model** as simple as possible, build knowledge over time
- ▶ **Bound the Estimates** of promotional lift to avoid operational risk



Learn More

Reach out for more discussion: bill.panak@halobi.com

Talk with Technical Account Managers – discuss upgrade to ML / AI

Develop a Target Architecture – design and build the ML

When to stop fitting additional parameters cannot be decided on a purely statistical basis. This is largely a matter of the experimenter's interpretations of the data based on substantive theoretical and conceptual considerations. Ultimately the criteria for goodness of the model depends on the usefulness of it and the results it produces.

K. G. JÖRESKOG

QUESTIONS?





THANK YOU